THE GREAT COMET OF 1882.—In No. 2521 of the *Astronomische Nachrichten* is an elliptical orbit of this comet by Mr. John Tatlock, jun., of Williamstown, Mass., with a period of 1376 years, which, as Prof. Krueger remarks in a note, differs materially from the results of Kreutz, Frisby, and Fabritius. It may be added that the new calculation can have little weight, being founded upon normals for October 8, November 24, and January 29, so that at the date of the first normal the comet was already far past the perihelion, and in fact during the whole interval only described a heliocentric arc of about 5° 10′. Dr. Kreutz has shown the possibility of closely representing by the same orbit the anteperihelion observations and those made subsequently to perihelion passage, though there may be need of much more minute discussion before it can be safely assumed that there was absolutely no appreciable effect from the comet's passage through the solar coronal region.

GEOGRAPHICAL NOTES

Science announces that Lieut. Schwatka, accompanied by Assistant-Surgeon Wilson, C. A. Homan, U.S. Engineer Corps, and three private soldiers, left for Chilkat, Alaska, May 22, from Portland, Or., on the steamer *Victoria*. They are provisioned for a six months' cruise, will employ Indians for packers, &c., and intend to ascend the Chilkat River to its head, make the passage to the head waters of the Lewis River, and descend the same to its junction with the Yukon, and descend the Yukon River to its mouth. It is said to be their intention to survey the course of these rivers; and there is no doubt that a properly qualified and equipped party would find abundance of useful work ready to their hands. The whole route has been travelled before, but not by persons in search of and qualified to obtain geographical information, except in very small part. The explorations of the Krause brothers on the Chilkat and vicinity have been alluded to before. The Yukon has been superficially examined by McMurray, Ketchum, Zagoskin, Dall, Whymper, Raymond, Nelson, and others, and a few points have been astronomically determined; but nothing like an exact map has been attempted, nor do the data for it exist. Astronomical and magnetic observations anywhere along its banks, and especially any data for a map of the Lewis River and its feeders (which are only known from the reports of prospectors and natives), would be of the highest interest.

AT last news has again been received by Dr. Schweinfurth from the well-known African explorer, Dr. W. Junker. He was still in the Nyam Nyam country, and his last news was dated October 16, 1882, from the residence of a chief named Semio some days' journey south of the Mosio district of the present maps. Dr. Junker, who has travelled through vast districts hitherto unexplored, will now soon return home. The last time he had spent principally in various excursions, during which he repeatedly crossed the Uëlle River to the south, and also the third degree north latitude, leaving his provisions in the care of his companion, Herr Bohndorff. On September 27 he again joined the latter after an absence of eighteen months, but found him so poorly that he had to send him home with the collections made up to that time. Bohndorff started with thirty-two porters, who carried the natural history and ethnographical collections. Of special interest for geographers was an excursion of Dr. Junker's, which he made south of the former Munsa district of the Monbuttu. Some seven days' journey (about 60 kilometres) south of this place he reached a large river named the Nepoko, which the traveller identified with Stanley's Aruwimi, one of the main northern tributaries of the Congo in the middle course of the latter.

DR. POGGE has sent a report from the Mukenge station on the Lulua regarding his return journey from Nyangwe, showing that this was not quite as peaceable as the journey to Nyangwe, and that he had frequently to defend himself seriously against the enmity of the natives. From the Lualaba to the Lomani, Dr. Pogge travelled by the same route as he had previously come with Lieut. Wissmann

ONE of the most recent additions to the "Bibliothèque d'Aventures et de Voyages" published by Dreyfous of Paris is a volume containing the letters and journals of La Perouse during his famous voyage round the world in 1785–88, which ended in the disappearance of the circumnavigator among the islands of the South Pacific. The volume is annotated by M. George Mantoux, who also supplies a prefatory memoir of the great sailor.

"IM Reiche des Æolus" is the title of a little book by Adolf von Pereira, published by Hartleben of Vienna, and containing reminiscences of a tour the author undertook to the Lipari Isles. It is profusely illustrated and contains a map.

AUSTRIAN papers report that a mountain in the neighbourhood of Czernowitz, in the Bukovina, is manifesting singular symptoms of disturbance. The ground around its base, to the extent of over 1000 fathoms, has opened out in wide and deep chasms. Most of the houses of a village on the spot (Kuczumare) have fallen down.

THE Thuringian Geographical Society met at Jena on the 17th inst., when Prof. Hæckel read a paper on the flora of Ceylon, and Herr G. Kurze one on the outposts of European civilisation on the way from Zanzibar to Lake Tanganyika.

THE SPECTRUM OF THE AURORA

IN view of the increased frequency of auroras, an inquiry into the present position of our knowledge as to their spectra has seemed to me desirable.

The accompanying table gives in wave-lengths all the observations I could find of the position of the bright lines of the auroral spectrum. J. R. Capron's "Auroræ and their Spectra," goes more fully into the subject than any other work I know, and therefore many of the positions are taken from it, being found on the page or plate indicated in the column headed "Page, &c." The authorities for other observations are given in the notes, but in other cases again I cannot now state whence I obtained them.

They are arranged approximately in order of accuracy,[1] but this is manifestly a very difficult matter to decide: if, as is very likely, I have made mistakes in this respect, I hope I shall be excused. I have gone very carefully into the matter, judging of the accuracy of the observations partly by their internal evidence, and partly by the weights which are in some cases attached to them by the observers themselves. The observers' probable errors are given in the table after the positions of the lines. I consider J. R. Capron has attributed too much accuracy to most of the observations of the auroral spectrum that have hitherto been made; certainly he has to mine. Nearly all the observers have measured the principal line; and, as its position is very well known, the measurements of it are to a considerable extent a guide to the amount of dependence that may be placed on the rest. Of course it may happen to be measured correctly by accident, while the rest are incorrect; but, on the other hand, if it is incorrectly measured, it is not likely that the rest will be correct. It is, therefore, very desirable that observers should measure this line at the same time as they measure any of the others; not necessarily in order to ascertain its position, but as an indication of the correctness of the rest; although it does not always happen that all the lines are by any means equally accurate.

The most probable positions of the lines, given at the foot of the table, are derived from the most accurate of the observations of each. Below are indicated the observations which have been used in the calculation in each case, with the weight given to each; for I have not taken the simple average of those used, but have given higher weights to those that seemed the best. The "Probable Error," as given below the "Probable Average," is partly calculated and partly estimated; it seems rather large; perhaps it should not really be so large.

My second series of observations (No. 18 in the table) are not absolute measurements, but only comparisons with α and γ. I have therefore not used them in the calculation of the general averages. This series is most likely affected by constant errors much larger than the probable errors given in the table from calculation. It seems rather curious that the actual errors of my first series (No. 17) are nearly all so much greater than the probable errors; and possibly the same thing may occur in some other cases.

E. B. Kirk's observation (No. 28) (though a very rough one as regards position) is one of the most striking of all; and, being unique, confirmation of it is very desirable. It will be described under the different lines, &c., concerned.

Where I have attached to an observation a Greek letter with a note of interrogation, it means that it is uncertain whether the

[1] But the observations of each observer are placed together, however unequal in accuracy they may be.

line observed was that named at the head of the column. It is not always possible to identify the lines, and, in some cases, my identifications disagree with J. R. Capron's.

This table shows eleven distinct and well-separated lines or bands, the existence of all of which may, in my opinion, be considered proved, all but λ having been seen by two or more observers.

Seven have been seen by numerous observers; I have myself seen them repeatedly, though none of the other four with certainty; but these (θ, ι, κ, and λ) have all been seen by trustworthy observers, and therefore may be accepted, though of course further confirmation would be advantageous.

I shall now consider each line separately.

β is the only line yet seen in the red. It exists in all auroras that are tinged with red, though the spectroscope does not always show it. I have always seen this line most easily with a single prism; but often the slit has to be so wide that it appears merely as a red border to α. In those reddish auroras where I have not been able to detect it, its invisibility is probably due to moonlight or some such cause. There can be no doubt that this line is the cause of the red colour. It varies greatly in brilliancy with reference to α; I have seen it as bright as α, but never brighter.[1] It sometimes exists when no redness is perceptible in the aurora, it being overpowered by the other rays.

α is almost always the brightest line in the spectrum. The only exceptions I have seen were that once β was as bright, and once ε brighter (see below). α probably exists in all true auroras. In a few very faint ones I have not been able to see it, perhaps because it has been overpowered by the diffused light of the spectrum, which certainly varies in brightness relatively to the brightness of the lines. Very often when there is no decided aurora, a luminosity overspreads the sky, uniform in all directions, though fading gradually towards the zenith; I have several times seen the line α in its spectrum, but at other times it has been invisible, though the light has appeared equally bright.

α and β are slender lines; it is not clear whether this can be said of any of the other lines or bands.

θ. Wijkander's is the only reliable observation of this line, but Vogel has one not far from the same place, and as he states his position is unreliable, there is no reason to doubt its being the same line. There is more doubt whether Peirce observed the same.

ι was observed both by Wijkander and Parent, and probably by Peirce and Copeland.

ε consists of two lines, according to Vogel, which I have called ϵ^1 and ϵ^2; the latter, he says, became very bright whenever β appeared. He is the only observer who describes two lines here (though I have at least once suspected ε to be double), and therefore it is difficult to tell which of them other observers have seen, or whether they have seen both combined as one band. In the table I have assumed that the latter has usually been the case, or at least that a band has been seen in this place; possibly this band has been different from either. I have therefore placed the observations which seem to apply to the band, or to the combined lines, in a separate column from those that seem to refer to the individual lines; but the average of the former includes the observations of the latter. Barker and Procter describe a band here; also E. B. Kirk, who, in 1880, August 12, saw it as a band fading towards the violet; but in 1882, August 4, it faded away on both sides, though quite sharp at the edges, and with a pretty narrow slit it was broken up into lines—his impression is there were six or eight; and that the group was broader than the distance between ϵ^1 and ϵ^2. He used one of Browning's "Maclean star spectroscopes," with an ordinary convex lens instead of the cylindrical one.

I have carefully examined my observations of this band, to see whether it has appeared more refrangible when the red line has been visible or bright than when there has been little or no red; but the result of this examination is inconclusive. However, in 1869, April 16, and 1874, October 3, I noted that ε was relatively brighter in the red part of the aurora than elsewhere, so far confirming Dr. Vogel.

ε exists in nearly all auroras that are bright enough to show any line besides α; perhaps in all. It varies very much in brightness with respect to the other lines. I have sometimes found it the brightest next to α, and once the brightest of all, viz. in 1882, November 20, between 5.50 and 6.5 a.m. There was twilight at the time in addition to the aurora, but I do not see how this could produce the effect. Between 5.40 and 5.50 that morning I estimated α three times as bright as ε, which was the second brightest line; but I see no way of avoiding the conclusion that it was the brightest of all a few minutes later.

ζ may be seen in most bright auroras. It is sometimes brighter than ε.

η is much more seldom visible; but I have several times seen it brighter than either ε or ζ; rarely as bright as γ, or brighter than it; but never so conspicuous as it, as the latter is rendered more visible by its position at the edge of the brighter part of the continuous spectrum.

γ and δ belong, I believe, to all auroras, always being visible when the spectrum is moderately bright. But their brightness varies with respect to each other and to α; indeed I do not know any two auroral lines that always vary together.

γ is usually the brightest line next to α, with my mode of observation. Several observers describe it as a band; Vogel as a double band (if not triple). Capron, on the authority of A. S. Herschel, says it consists of "two lines, the first rather more frequently noted than the second" (the more refrangible). I cannot see that this assertion is borne out by the accompanying table, but if it is correct, the two lines must be about 4700 and 4654. I have several times seen γ as a band fading towards the violet. E. B. Kirk, in 1880, saw it as a band; but in 1882, August 4, resolved it into bright lines—a broader group than ε, less distinctly bounded, and with a less bright centre, and containing, he thinks, about twice as many lines.

κ appears to have been noted by two observers; one being Wijkander, who seems very accurate.

δ is invariably fainter than γ to me.

λ. Seen only by Lemström; but he says that in 1871, November 22, he "observed it with certainty three separate times."

The likelihood of the existence of lines in the violet or blue (such as λ or κ) in addition to those commonly seen, is manifest to me from the fact that I have twice seen purple in auroras. The first time was at Sunderland, 1869, May 13, at 10.55 p.m., when for a minute or two there was a large patch of coloured light—deep crimson, exquisite pink, and most lovely pinkish purple, gradually passing into one another. The crimson was the same colour frequently observed; the pink was very different, and far more beautiful. The crimson lasted after the other colours faded. The second time was in Skye, 1872, August 3, about 10.30 p.m., when for two or three minutes there were large patches of a beautiful, but not deep, pinkish purple. I had no time to observe the spectrum in either case. It is manifestly improbable that these colours would be caused by any of the ordinary lines of the spectrum; probably one line in the violet or blue, in combination with the red line, could account for the various tints.

Colours are closely connected with the spectrum; but I cannot say I ever saw any in the aurora, except the purples and pink just referred to, that might not be readily accounted for by the ordinary lines of the spectrum with or without the red line; as the only other decided colours I have seen are red and the usual greenish colour, varying somewhat in intensity and perhaps tint. I have seen other less decided colours; but, considering the extent to which the colours of the aurora might be affected by mist, smoke, twilight, moonlight, &c., and one's judgment by the effect of contrast, I could not say that they certainly belonged to the aurora.

The continuous light of the spectrum always reaches from α to δ; being very faint from γ to δ, rather faint from α to ε, and sometimes brighter from ε to η or to ζ than beyond. Sometimes when ε is too faint to be detected, the abrupt brightening of the continuous spectrum at that point is plainly visible. Kirk, in 1882, on the occasion already mentioned, when the spectroscope was pointed between the streamers, saw the spaces from α to ε and from ε to γ apparently filled with shifting lines, very numerous and close. Not that the lines really shifted, but their flickering caused them to appear shifting, and possibly also to appear more numerous than they really were. When the spectroscope was pointed on the streamers these lines were obscured by the greater brightness of the rest of the spectrum. I have myself often suspected lines between ε and γ, besides ζ and τ.

It has been suggested that some of the lines may vary somewhat in position; but there is no evidence yet that the apparent variations are due to anything but errors of observation.

A flickering of the lines has been observed in certain cases; in all probability this occurs with the whole spectrum when the

[1] In considering the relative brightness of the different bands, it must be borne in mind that it varies considerably with the width of the slit, the dispersion, &c.

POSITIONS OF LINES, IN WAVE-LENGTHS.

	Page, &c.	β	α	θ	ι	ϵ^1	ε	ϵ^2	ζ	η	γ	κ	δ	λ
1. Wijkander, A.	p. 96			5359±3	5289±5	5239±4			4996±9	4871	4692±2	4366	4280±3	
2. Vogel, Dr. H.C., av.	p. 198		5571·3±·9											
3. ,, ,,	pp. 99, 105	6297±14	5569±2	5390		5233±4		5189±9	5004±3		4663±3 (4694 to 4629)			
4. Parent, Lieut.	p. 96				5280±1			? ε 5207±11		4873	4708±5		4286±16	
5. Zöllner, F.	pl. xii.	6279												
6. Lemström, K. S.[1]			5569			? ε 5250			4959		4686		4256	4112
7. German North Polar Expedition.			5569											
8. Copeland, R., 1880.			5571·6±2		ι? 5275		ε? 5120±22		ζ? 4930±21		4714±20		4320±20	
9. Ångström, A. J.	p. 198		5567											
10. ,, ,,							? ϵ^2 5210				4720			
11. Von Oettingen.		6290±70	5548±30								4660±25		4240±12	
12. Barker, G. F.	pl. xii.	6300	5550 (this	series is	±20 to	± 6)	(5330 to 5200)		(5050 to 4990)	(4930 to 4850)	4705 (4740 to 4670)		4310	
13. ,, ,,	p. 97	6200	5620					? ε 5170	5020	? γ 4820				
14. Rowland, H. A. (Troy).		6283	5543										4250	
15. Respighi, L.			5573						5050					
16. Peirce.[2]			5570	θ? 5450	5315			? ε 5205		4860	4640		4310	
17. Backhouse, T. W.		6010	5605±14				5225		5025±9	4920	4663±10		4302±6	
18. ,, ,,		6280±100					5227±6		5002±5	4874±5			4370±6	
19. Struve, O., 1868.			5545±20											
20. Herschel, A. S.			5555±25											
21. Maclear, Capt. J. P.	pl. xi.		5510								4685	4410	4280	
22. Procter, H. R.		6270	5590				(5200 to 5100) 5170				(4840 to 4650) 4760		4240	
23. Smyth, C. P., 1872	p. 98	6350	5580				? ϵ^1 5300		5100	4900				
24. Ellery, R. J. (Melbourne).		6350	5600											
25. Church, A. H.		6180	5600								4870		4480	
26. Lindsay, Lord.	p. 102		5690				5330		5170		4850		4340	
27. Clarke, A., Jun.	p. 97		5690				5320				4850		4350	
28. Kirk, E. B.[3]			5800				5150				4850		4300	
29. T. F., Torquay.	p. 96	6400	5880								4870		4400	
30. Elger, T. G.	p 96	6550	5880						5280		4870			
Probable Average ...		6289	5569·7	5359	5285	5237	5226	5199	5001	4870	4688	4366	4278	4112
Probable Error		±6	±0·6	±15	±8	±8	±8	±8	±8	±8	±9	±12	±8	±20
Observations used for Average		3, *w* 1. 5, *w* 1. 12, *w* ·2. 14, *w* ·2	2, *w* 1. 6, *w* 1. 7, *w* ·5. 8, *w* ·5. 9, *w* ·5.	1	1, *w* 1. 4, *w* 1.	1, *w* 1. 3, *w* ·5	1, *w* 1. 3, *w* ·5. 4, *w* ·5. 6, *w* ·3. 10, *w* ·25. 12, *w* ·2. 16, *w* ·15. 17, *w* ·1.	3, *w* 1. 4, *w* 1. 16, *w* ·3.	3, *w* 2. 1, *w* 1.	1, *w* 1. 4, *w* ·6. 16, *w* ·2.	1, *w* 2. 3, *w* 1. 4, *w* 1. 6, *w* ·5. 11, *w* ·3. 12, *w* ·3. 10, *w* ·1. 17, *w* ·1.	1	1, *w* 2. 4, *w* 1. 6, *w* ·5. 11, *w* ·3. 12, *w* ·3. 14, *w* ·2. 16, *w* ·1. 17, *w* ·1.	6

[1] *Archives des Sciences Physiques et Naturelles*, 1874. [2] Reported by Winlock: *American Journal of Science*, vol. xlviii. [3] *Observatory*, 1880, p. 542; 1882, p. 272.

aurora flashes, though it does not seem to have been remarked. My own observations have all been made with a very wide slit, or, which comes practically to the same thing, with small dispersion. This has been owing to the usual feebleness of the greater part of the spectrum; and many of the other observers have for the same reason also used a wide slit. It may be useful to explain the method by which most of my observations were made, as it seems successful for perceiving the lines and general character of the spectrum, though not for measuring the positions. I have simply used one or two, or in some cases three prisms, usually of Chance's dense flint glass, and for a slit, the space between window-shutters nearly shut, or between two planks placed against the window. I hold the prisms in my hand on a simple stand, not always fixed, but so that they may be easily moved with respect to each other and to the slit, so varying the amount of dispersion. The best results are usually obtained by holding them in the position of almost the greatest deviation possible. Varying the deviation alters the focus. If one plank or shutter is placed rather further forward than the other, the apparent width of the slit is varied at will by simply moving one's head to one side or the other. By these means it is easy to observe all the different features of the spectrum, which require different widths of the slit and degrees of dispersion. A vacuum-tube or other light for comparison may be placed behind the slit, though it is obvious that with small dispersion accurate comparisons cannot be made.

I have made some observations with a Browning's "Miniature Spectroscope," with the diaphragm off, but it gives less light than simple prisms. I have also tried a "half-prism spectroscope," by Hilger, but unsuccessfully; but I find that by taking off the outer lens of the eyepiece and the diaphragm much more light is obtained; I have not, however, had an opportunity of trying this plan yet on an aurora.

The number of nights of aurora on which I have seen each line, between 1871, November 1, and 1883, March 27, is as follows:—

β	α	ϵ	ζ	η	γ	δ
11	83	34	14	7	33	26

On thirteen nights I could not be sure of any line, but on six of these I suspected α, or else there was an abrupt fading away about where α should come. There were other auroras—mostly faint ones—whose spectra I did not observe.

The lines visible in the spectrum often vary in the course of a few minutes, and indeed are not always the same in different parts of the sky at the same time. I have never been able to detect that any particular feature of the spectrum belongs to any particular type or feature of aurora, except that the line β belongs to red auroras.

Dr. Vogel thinks it probable that the auroral spectrum is a modified air-spectrum. The following are the most striking coincidences or approximations between my revised list of auroral lines and Vogel's lists of lines in the spectra of air and its constituents. They are sufficient to make the subject one worthy of consideration; but perhaps this is as much as can as yet be said. There are other approximations to very faint air or gas lines, which he regards as of some importance; but, as the lines in the latter spectra are so numerous, one would naturally expect such coincidences accidentally.

Aurora Spectrum Coincidences.

Aurora.		Air.		
ϵ^1 5237	...	Moist air	5231	dull.
ϵ 5226	...	N	5224	very bright.
ϵ^2 5199	...	O	5189	very bright.
	...	H	5187	very bright.
ζ 5001	...	N	5004	bright.
	...	Air	5008	very bright.
	...		5002	very bright.
η 4870	...	O	4870	moderately bright.
γ 4688	...	N	4704	very intense.
κ 4366	...	O	4372	moderately bright.
	...	N	4363	bright.
	...	N	4357	bright.
	...	H	4358	very bright.
δ 4278	...	N	4275	very bright.

A. S. Herschel has pointed out the proximity of β to the dark atmospheric band α at 6279.

Sunderland THOS. WILLIAM BACKHOUSE

SCIENCE AT KAZAN[1]

THE Kazan Society of Naturalists, which began its *Memoirs* in 1871 with the remarkable work of M. M. Bogdanoff on the birds and mammals of the black earth region of the basin of the Volga, has continued since to publish a series of most valuable explorations of the region of the lower Ural, Volga, and Siberia. We notice thus in the first eight volumes of its *Memoirs* the researches on earthquakes in Siberia, in Turkestan, and on the Ural, by M. Orloff; several valuable papers on the Geology of the Obschiy Syrt plateau, by M. Sintsoff; of the Government of Vyatka, by M. Krotoff; of the Government of Kazan, by Prof. Stuckenberg; and of the banks of the Kania, by M. Zaïtseff; a work on the birds of Caucasus, by M. Bogdanoff; a paper on the Teleostei of the mouth of the Volga, by M. Vakovleff; the history of the development of the *Acipenser sturio*, by M. Zalensky; and mycological researches, by M. Sorokin; several papers on the flora of the Government of Perm, by M. Kryloff; and two papers by M. Levakovsky on the substitution of certain species of plants for others in a given region; as well as several valuable researches into the anthropology of the Bashkirs, Voguls, and Votyaks, by MM. Malieff, Sorokin, and Ostrovsky.

The three last volumes of the *Memoirs*, which we have now before us, contain also many valuable papers. In the department of botany we notice the second part of M. Kryloff's flora of the Government of Perm. It contains a complete list of all Phanerogamæ discovered in this interesting province, which includes the Ural Mountains, completed by special researches into the subarctic and Alpine flora of this region. A map shows pretty well how such plants as the *Viburnus opulus*, the *Cystisus biflorus*, the *Tilia parviflora*, and the cereals are stopped in their extension by the Ural Mountains, reappearing again on their eastern slope; whilst others, like the *Quercus pedunculata*, or the *Acer platanoides*, are stopped in their extension towards the east by the western spurs of the Ural and the lowlands of Siberia, their north-eastern limit meeting nearly together with the south-western limit of extension of the *Pinus cembra*, the *Lonicera cærulea*, the *Spiræa media*, and *Polygonum viviparum*. The whole list contains 948 Angiospermæ, and 8 Gymnospermæ. The Cryptogamæ are represented by 38 Lycopodiaceæ and 124 Lichens.—Dr. Martianoff publishes valuable materials for the flora of the Minusinsk region in Eastern Siberia, comprising a sketch of its climate (according to five years' meteorological observations by A. Krapotkin) and its physico-geographical characters. The flora of Minusinsk is much varied, as it embodies three separate botanical regions: the Alpine, the forest, and the steppe floras, intermingled with one another. Its general character is that of the Altai region, and out of 777 Phanerogams, no less than 714 are Altaic, whilst only 59 belong to the flora of Eastern Asia. The Alpine flora has but 104 representatives; the forest-flora is the most widely spread, and at the same time the richest; it is represented by 579 species. The steppe flora, which covers nearly one-quarter of the Minusinsk district, and appears sporadically even on the plateaux of the hilly tracts, numbers 315 species. We can only notice here the excellent botanical sketches of separate parts of this "Siberian Italy" which we find in M. Martianoff's work. His list of plants, which contains 760 species of vascular plants, is unusually rich also in lower plants, the number of determined Fungi and Myxomycetes comprising 644 species.—An interesting work which has cost much labour to its author, M. Kryloff, is a description of all drugs—mostly plants—used in the popular pharmacies of the Governments of Kazan and Perm. The list comprises about 200 plants, with a description of their use in popular medicine.

The zoological papers in this volume are but two:—On the innervation of the heart of the *Esox lucius* and *Acipenser ruthenus*, by MM. Kazem-beck and Doguel; and on the ear-labyrinth of the Plagiostomi (*Acipenser ruthenus*, *A. sturio*, and *A. schiffa*), by M. Sizoff. Both papers have appeared also in the *Archiv für microskopische Anatomie*.

Geology is represented by the following papers:—On the upper part of the mottled marls, by Prof. Stuckenberg; on the Permian in the Governments of Kazan and Samara, by A. Zaitseff; and on the geology of the Volga between Nijni-Novgorod and Kazan, by P. Krotoff. The Zechstein appears in the region situated between the Kama, the water-

[1] *Memoirs of the Society of Naturalists at the Kazan University*, vols. ix., x., and xi., 1880-1882.